

# The Great Basin Naturalist

PUBLISHED BY THE  
DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY  
BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH

Museum of Comparative  
Zoology  
OCT 21 1941

79,665

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VOLUME I

JUNE 30, 1940

Nos. 3 & 4

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## A BIOTIC STUDY OF THE KAIPAROWITS REGION OF UTAH (1)

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### INTRODUCTION

The Kaiparowits region because of its aridity, ruggedness, and inaccessibility has remained practically unknown biologically. Located between parallels  $37^{\circ}$  and  $38^{\circ}$  and meridians  $110^{\circ} 45'$  and  $112^{\circ} 30'$ , it is bounded on the southeast by the Colorado River, on the south by the Arizona State line and the west by the Paria River—Bryce Canyon area, while to the north is the Aquarius Plateau and on the northeast Halls Creek and the Henry Mountains. This region as designated by Gregory and Moore (2) has an area of about 5,400 square miles. A bird's-eye view of the area, looking north from the Utah-Arizona state line, is shown in Figure 1. Not all the region shown in this figure has been traversed by members of the surveying parties. Instead we have confined our efforts, in the main, to studying the Escalante River drainage.

In this the first of a series of reports on the region, we propose to briefly outline the purpose and extent of the investigation to date, and then discuss the biotic formations and certain animal groups.

This work was begun on June 8, 1936, when the writer, D. E. Beck, James Bee and C. L. Hayward spent 810 man hours in various parts of the Escalante River drainage. In September 1937, C. L. Hayward and the writer spent 180 man hours in the Paria valley. The

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(1) Contribution No. 83—Dept. of Zoology and Entomology, Brigham Young University.

(2) Gregory, H. E. and Moore, R. G., The Kaiparowits Region. A Geographic and Geologic Reconnaissance of Parts of Utah and Arizona: U. S. Geol. Survey Prof. Paper 164, 1931.

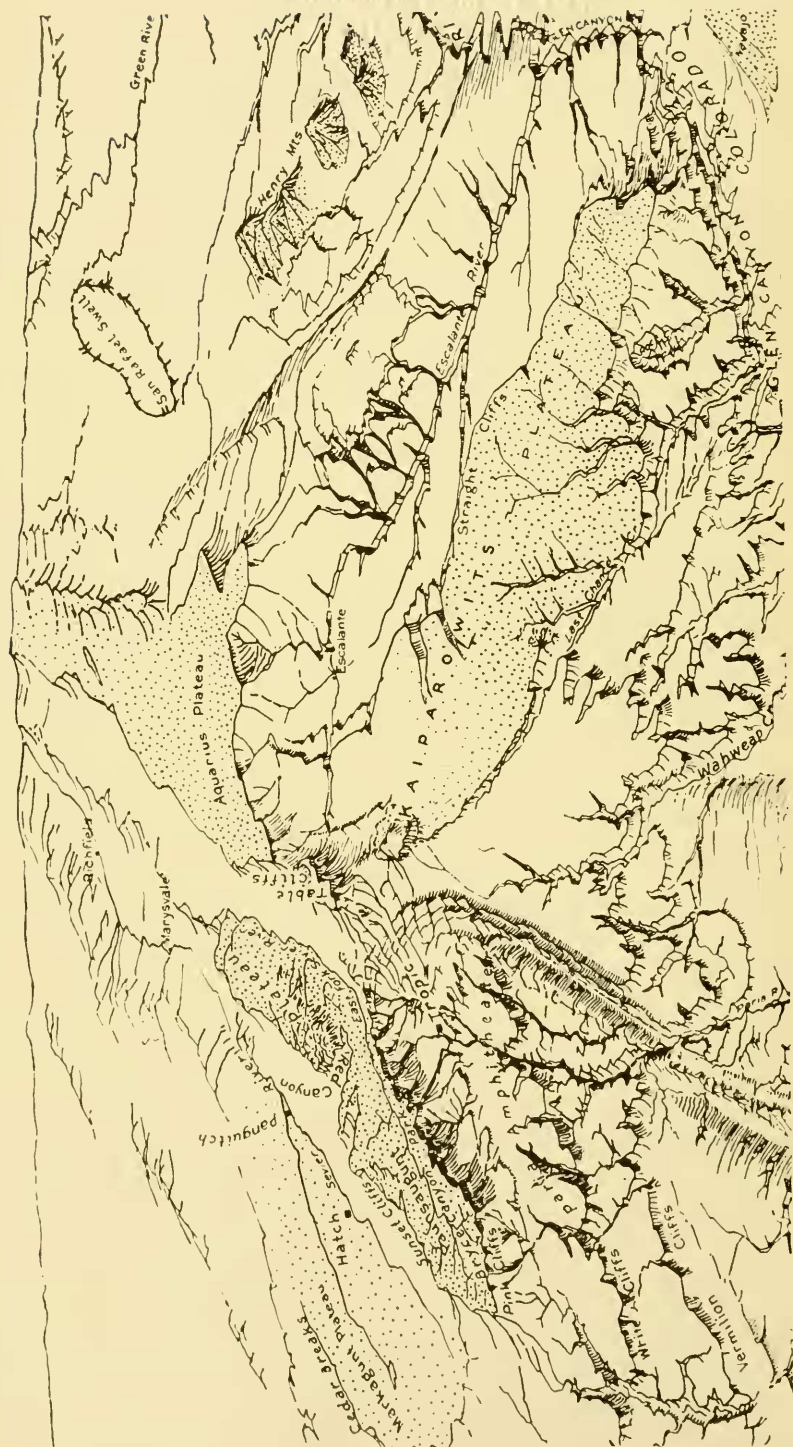


Figure 1. The Kaiparowits region looking north from the Utah-Arizona state line. From Table Cliff pass to the Navajo Mountains, it is approximately 90 miles, to the Henry Mountains from Navajo Mountains it is 40 miles and from the Henry Mountains to Table Cliff Pass is about 65 miles. (From Gregory — Zion-Pryce Museum Bull. No. 4, 1940, through the courtesy of Mr. H. V. Walker, Naturalist, Zion National Park.)

work was carried on in 1938-39-40 by Dr. Beck who spent 760 man hours in 1938 with a party of three besides himself, consisting of James Bee, Wilmer W. Tanner and George Cannon. (Fig. 2). In 1939, Dr. Beck, Harry Chandler, Tom Peterson, Josiah Barker and Jesse Spencer, the latter two men from Escalante acting as pack horse guides, spent 590 man hours. They worked mainly during the month of August, exploring the course of the Escalante River from the mouth of Calf Creek to the Colorado River, then south four miles to the



Figure 2. Members of the 1938 party. Left to right—D. E. Beck, George Cannon, Wilmer Tanner and James Bee. (By permission of Utah Magazine.)

"hole in the rock," famous crossing of the Colorado made by Mormon Pioneers in the winter of 1879-80. Dr. Beck placed a bronze pioneer marker on a prominent ledge over which the intrepid colonizers struggled to get their 80 wagons, 1200 head of live stock, 200 men and women, and 50 children down and across the river. This pioneer undertaking ranks as one of the most notable and daring adventures engaged in by the Mormon colonizers, in southern Utah.

In 1940, Dr. Beck and Irvin McArthur spent 70 man hours during the last of May and the early part of June collecting and photographing the area east of the Willow Spring Tank down to the Escalante River.

#### TOPOGRAPHY

This area was chosen for faunistic study because it is a part of the Colorado Plateau province in south central Utah which until recently

has been practically inaccessible. The topographic features are plateaus, mesas, isolated cliffs and buttes and deeply intrenched canyons in sedimentary rocks, mainly Mesozoic in age. The present topography is due to water and wind erosion combined with folding and faulting. As one looks out over this great expanse from the auto highway on Table Cliff pass a thrilling panorama of the results of the action of erosion is beheld. From this point to the southeast across Glen Canyon, at the end of the Kaiparowits Plateau, 90 miles distant, may be seen Navajo Mountains (Fig. 1). A little northeast and at a distance of 65 miles the Henry Mountains stand out conspicuously. Most of the area within this triangle is the Escalante River drainage area of approximately 1,900 square miles. The Aquarius Plateau to the north, in which the Escalante River and many of its tributaries originate, has an elevation of 10,000 to 11,600 feet. From this lava capped, forest covered plateau, the country slopes to the south; Glen Canyon at the junction of the Escalante River being only 3,305 feet in elevation. All this area is very well drained, small as well as deep gullies and washes are almost endless. As a result of this the scant precipitation is soon conveyed to the Colorado River. Travel over much of this region is practically impossible without a guide and pack horses.

#### CLIMATE

From the records on precipitation kept at a numbers of towns in the Kaiparowits region it is evident that the rainfall is insufficient for the production of crops without the aid of irrigation. The annual mean rainfall at Escalante, elevation 5,700 feet, for the years 1901 to 1927, was 12.14 inches and for Cannonville during the years 1890 to 1918 it was 11.37 inches. Along the Colorado River from Halls Creek to Lees Ferry the mean annual rainfall varies from 5 to 8 inches. During the months of July, August and September from one third to one half of the annual rainfall is precipitated as thunder showers, oftentimes causing floods and being of little benefit to the county because of the rapid runoff and evaporation.

The annual, as well as daily, temperature variation is very great, definitely affecting the plant and animal life of the region. Throughout this entire region subzero temperatures may be experienced during the winter. At Cannonville, altitude 6,000 feet, a record of 32° below zero was recorded for the month of February. During the summer months high temperatures up to 120° are fairly common. Then, too, the daily changes are considerable. On June 21, 1936 at Willow Spring Tank, in the Escalante Desert, the atmospheric tem-



perature reached  $108^{\circ}$  while the surface soil reached  $134^{\circ}$ . On the following morning, June 22 at 4:40 A. M. the atmospheric temperature was  $49^{\circ}$ , a difference in less than twelve hours of  $59^{\circ}$ , and this in spite of clear cloudless skies. The zoologist soon learns that he must collect in the evening and early mornings in this desert country. After sundown the hiding species of the desert begin their foraging and one is soon made aware of the statement that the "night has a thousand eyes."

#### PREVIOUS WORKERS

Finally because of the nature of the country, desert conditions, with extremes in temperatures, and the paucity of biological information we decided to collect and study the fauna and flora of this region. While considerable has been written about the geology of the area by Powell (3), Dutton (4), Gilbert (5), and Gregory and Moore (6), very little has been published on the biota. In 1922 Drs. Moore and Hungerford (7) reported upon the water insects collected in this region. They listed eight species which were collected by Dr. Moore while engaged in his studies on the geology of this region.

The reptiles and amphibians of Bryce Canyon National Park were discussed by Tanner (8) in 1930, and this same year Chamberlin and Berry (9) listed the Mollusca they had collected in the Henry Mountains.

Miss Helen Dixon (10) spent considerable time during several summers studying the plant associations of the southern High Plateaus of Utah. Most of her study was carried on in Wayne County to the north of the area under consideration. In May, 1931, Mr. W. D. Stanton (11) completed a master's thesis for the Botany Department

(3) Powell, J. W., Exploration of the Colorado River of the West and its tributaries. Smithsonian Institution, 1875.

(4) Dutton, C. E., Report on the Geology of the High Plateaus of Utah. U. S. Geog. and Geol. Survey Rocky Mts. Region, 1880.

(5) Gilbert, G. R., Report on the Geology of the Henry Mountains, 2nd Edition, 1880.

(6) Idem. 1931.

(7) Moore, R. C. and Hungerford, H. B., Water insects from a portion of the Southern Utah desert: Kansas Univ. Sci. Bull. Vol. 14, pp. 409-422, 1922.

(8) Tanner, V. M., The Amphibians and Reptiles of Bryce Canyon National Park, Utah: Copeia, No. 2, June 30, pp. 41-43, 1930.

(9) Chamberlin, R. V. and Berry, E., Mollusca from the Henry Mountains and some Neighboring Points in Utah. Bull. Univ. of Utah, Biol. Series, Vol. 1, No. 3, pp. 1-7, Oct., 1930.

(10) Dixon, Helen, Ecological Studies on the High Plateaus of Utah: Bot. Gaz. Vol. 97, pp. 272-320, 1935.

(11) Stanton, W. D., A preliminary study of the Flora of the Henry Mountains of Utah. A masters Thesis; unpublished, Brigham Young University, May, 1931.

at Brigham Young University, in which he discussed the plant associations or formations of the Henry Mountains. Mr. Stanton recognized six formations and expressed the belief that 60 per cent of the flora of the mountains had a northern origin.

Dr. Gregory (12) briefly discusses the plants of the area recognizing three plant zones. He also included a short list of forest plants which was furnished by Wallace M. Riddle, forest supervisor.

These are the only studies that have come to our attention in which the plants and animals have been discussed. It is obvious from this that very little is known about the fauna of this portion of Utah. While much remains to be done in completing the ecological studies and making the desired interpretations of the data collected, it is our belief that the following discussion of the plant and animal associations and the animals listed should be published at this time. The writer desires to thank Mr. H. V. Walker, Park Naturalist of Zion National Park for the permission to use Figures 1 and 10; Dr. D. Eldon Beck and Mr. Harry Miller of the Utah Magazine for the use of Figures 2, 3, 4 and 11; Dr. B. F. Harrison and Mrs. Desma Hall Galway for aid in determination of the plants collected, and the various members of the collecting parties. The thrill, however, of exploring and collecting in this virgin, unstudied region is its own reward.

#### BIOTIC COMMUNITIES

In making a study of this kind it is of first importance that the species of the area be collected, listed and their abundance and distribution determined. With information of this kind at hand it is possible, with knowledge of the topography, climate and fauna, to make an interpretation and classification of the communities.

#### DESERT-PRAIRIE COMMUNITY

The entire Kaiparowits region belongs to the North American Grassland biome and much of it to the mixed Prairie association, if we follow recent workers in Bio-ecology (13). The Escalante Desert, altitude 4,250 to 5,200 feet, extending south along the straight cliffs and east along the Escalante River to Glen Canyon, contains many of the dominants, sub-dominants and influents of the mixed Prairie association. This area is, however, along an ecotone since there is a noticeable merging of the mixed prairie with the non-grasslands; also

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(12) Idem, p. 24.

(13) Clements, F. E. and Shelford, V. E., Bio-Ecology, 1939.

many of the buffer species between the Lower and Upper Sonoran zones, are encountered. Because of the mixing of the desert and prairie species in what appears to be a rather wide ecotone I prefer to call this the Desert-Prairie community to the Mixed Prairie association now in common usage. This desert may be divided into a number of seral stages. The shifting sands, steep walls of the washes and canyons, and water holes provide many dynamic seral groupings (Figs. 3, 4, 5, 6, 7, and 8). Disregarding these seres at present, but listing



Figure 3. Death Hollow from the Skyline Bridge on the road between Boulder and Escalante. Practically no life is able to maintain itself upon the steep walls. (By permission of Utah Magazine.)

the dominants and influents we find the following species, all of which were collected 50 miles southeast of Escalante at Willow Spring Tank and Hall Cave, water holes on the desert, between the straight cliffs and the Escalante River and about 20 miles northwest of Glen Canyon:

## PLANTS

*Ephedra torreyana*; *Hilaria jamesii*; *Aristida glauca*; *A. longiseta*; *Stipa comata intermedia*; *Oryzopsis hymenoides*; *Sporobolus flexuosus*; *Polypogon monspeliensis*; *Agrostis* sp.; *Poa fendleriana*; *Bromus tectorum*; *Eleocharis montana*; *Yucca harrimaniæ*; *Quercus undulata*; *Q. turbinella*; *Q. pungens*; *Eriogonum inflatum*; *E. shockleyi*; *E. nummularæ*; *Eriogonum* sp.; *Polygonum aviculare*; *Cycloloma atriplicifolium*; *Chenopodium album*; *Salsola pestifer*; *Amaranthus blitoides*; *Tripterocalyx pedunculatus*; *Tripterocalyx cyclopterus*; *Abronia alliptica*; *Clematis liquisticifolia*; *Stanleya* sp.; *Lepidium* sp.; *Cleome lutea*; *Coleogyne ramosissima*; *Coreania stansburiana*; *Krameria glandulosa*; *Astragalus americanus*; *Linum aristatum*; *Chamaesyce parryi*; *C. fendleri*; *Rhus utahensis*; *R. trilobata*; *Sphaeralcea coccinea*; *Opuntia rhodantha*?; *Mentzelia multiflora*; *Lepargyrea rotundifolia*; *L. argentea*; *Pachylophus marginatus*; *Asclepias cryptoceras*; *Gilia gunnisonii*; *Euploca convolvulacea*; *Cryptanthe crassise-pala*; *Solanum triflorum*; *Pentstemon ambiguus*; *Coleosanthus oblongifolius linifolius*; *Chrysothamnus nauscosus*; *C. filifolius*; *Erigeron bellidiastrum*; *Franseria acanthicarpa*; *Xanthium pensylvanicum*; *Wyethia scabra*; *Helianthus anomalus*; *Laphamia palmeria*; *Hymenopappus eriopodus*; *Artemisia filifolia*; *A. mexicana*; *A. cana*; and *Ptiloria pauciflora*.

## MAMMALS

The following represent only the species collected in traps or observed; a number of species were reported by some of the old settlers to have been in that region when it was first occupied:

*Perognathus l. arizonensis*; *Dipodomys o. cupidineus*; *Peromyscus maniculatus sonoriensis*; *Lepus c. deserticola*; *Citellus l. cinnamomeus*; *Lasionycteris noctivagans*; *Pipistrellus hesperus hesperus*; *Thomomys b. absonus*; and *Canis estor*.

The pronghorn antelope, *Antilocapra americana*, was common in this area in pioneer days, 1875, extending northward along the Colorado River to the San Rafael Swell, the Green River and the Uinta Basin. Today there are remnant herds in Emery County around the San Rafael and Green River, south of the Uinta Basin.

## BIRDS

Only the common species that are met with daily are listed:

*Mimus polyglottos leucopterus* (A young specimen was collected June 21, by D. E. Beck (14); *Chordeiles minor henryi*; *Cyanocephalus*

(14) Tanner, Vasco M., The Western Mocking Bird in Utah, Proc. Ut. Acad. of Sci., Vol. 13, pp. 185-87, 1936.

*cynocephalus*; *Euphagus cynocephalus*; *Sayornis saya saya*; *Zenaidura macroura marginella*; *Lanius ludovicianus excubitorides*; *Bulo virginianus pullascens*; *Sialia currucoides*.

#### INSECTS

In addition to the aquatic insects reported elsewhere in this study the following characteristic species are listed:

*Hesperotettix vividis*; *Heliasius aridus*; *Trimerotropis vinculata*; *Cacama valvata*; *Eupagoderes sordidus*; *Eleodes obsoleta* var. *porcata*; *E. extricata* var. *cognata*; *E. hispilabris*; *Erax barbatus*; and *E. argyrosoma*.

The grazing of sheep, horses and cattle in the Kaiparowits region has made changes in the plant cover and the native fauna. Thousands



Figure 4. Natural Bridge, near the mouth of Calf Creek. (By permission of Utah Magazine.)





Figure 5. *Colcogyne-Krameria* associes at Willow Spring Tank looking south-east showing the straight cliffs with Navajo Mountain at the end. The light areas (A) are mainly *Krameria* while the dark areas (B) are mainly *Colcogyne*. (Photo by D. E. Beck, 1940.)



Figure 6. The Hall, showing the manner in which the Entrada Sandstone (Jurassic) weathers. The plant cover is mainly Blackbrush, *Colcogyne ramosissima*. (Photo by D. E. Beck, 1938.)

of acres of sandy desert around the Hall and Willow Spring Tank, (Figs. 5 & 6), at present, have a plant cover, estimated through counting various plots, which is composed of Blackbrush, *Colcogyne ramosissima*, 75 per cent; *Krameria*, *Krameria glandulosa*, 10 per cent;



Figure 7. The Chimney Rock or Sentinel, near Willow Spring Tank. The sand dune in the right corner is being held by *Ephedra torreyana*. The light colored plants are *Krameria* and the dark colored ones in the background are *Colcogyne*. The Pocket Mouse, *Perognathus l. arizonensis*, and Kangaroo Rat, *Dipodomys o. cupidiinus* burrow into the sand dunes. (Photo by D. E. Beck, 1940.)



Figure 8. Desert near Coyote Gulch. Showing the grass *Aristida longisetia* (B) in association with *Colcogyne* (A) and *Ephedra torreyana* (C). (Photo by D. E. Beck.)

Matchweed, *Gutierrezia* spp., 5 per cent; Brigham tea, *Ephedra torreyana*, 2 per cent and Prickley pear, *Opuntia rhodantha*, 2 per cent. It was also noted that there is considerable variation between *Coleogyne* and *Krameria*, with respect to their dominants. In Figure 5 the light areas are 70 to 80 per cent *Krameria* while in the dark areas are 70 to 80 per cent *Coleogyne*. This may be due to a number of factors such as, soil and water, either one or both. In Figure 7 in the right hand side *Ephedra* is shown serving as a sand binder, while the plant in the light foreground is mainly *Krameria* and the dark plant extending back to the chimney rock is *Coleogyne*.



Figure 9. Pinyons and Junipers at Escalante, Utah. The Escalante River in the background is lined with cottonwoods, *Populus fremontii*. (Photo by D. E. Beck, 1940.)

Between Collett Wash and Coyote Gulch are areas in which the grasses, *Aristida glauca* and *A. longiseta* are common (Figure 8). These grasses are not so palatable to live stock, as other species, which may account for their abundance at present.

#### PINYON-JUNIPER ASSOCIATION

Surrounding the Escalante desert on the foothills of the Aquarius Plateau, Circle Cliffs, Straight Cliff, Table Cliff, Potato Valley, and Paria Valley is a Pinyon-Juniper association in the Woodland, Pinyon-Juniper formation at an altitude of 5,500 to 7,000 feet (Fig. 9).

Some of the dominants of this association are:

## PLANTS

*Pinus edulis*; *Juniperus utahensis*; *Phragmites communis*; *Puccinellia nuttalliana*; *Tradescantia scopulorum*; *Juncus balticus*; *Juncus longistylis*; *Quercus wilcoxii*; *Comandra pallida*; *Rumex crispus*; *Atriplex confertifolia*; *Cercocarpus intricatus*; *Amelanchier* spp.; *Sphaeralcea marginata*; *S. munroana*; *Tamarix gallica*; *Fraxinus anomala*; *Frasera speciosa*; *Apocynum cannabinum*; *Asclepias tuberosa*; *Gilia subnuda*; *Cryptantha fendleri*; *Verbena bracteosa*; *Castilleja exilis*; *Grindelia squarrosa*; *Petroradia pumila*; *Chrysothamnus graveolens*; *Aster hirtifolius*; *Chaenactis douglasii*; *Artemisia forwoodii*; *A. ludoviciana*; *A. carruthii*; *Ptiloria exigua*.

## MAMMALS

The following are common influent species found ranging in, as well as above and below, this belt:

*Neotoma l. monstrabilis*; *Eutamias adsitus*; *Citellus l. lateralis*; *C. v. utah* (15); *C. l. cinnamomeus*; *Peromyscus* sp.; *Taxidea taxus berlandieri*; *Cynomys parvidens*; and *Sylvilagus a. warreni*.

## BIRDS

Most of the following birds were collected in the environs of Henrieville:

*Poliioptila c. amoenissima*; *Virco gilvus swainsoni*; *Agelaius* sp.; *Hedymeles m. papago*; *Guiraca c. interfusa*; *Passerina amoena*; *Passerculus s. nevadensis*; *Pipilo maculatus montanus*; *Poocetes g. confinis*; *Chondestes grammacus strigatus*; *Spizella passerina arizonae*; *S. breweri breweri*; *Zonotrichia l. gambelii*; *Acronautes s. saxatilis*; *Petrochelidon u. albifrons*; *Aphelocoma c. woodhousii*; *Cinclus mexicanus unicolor*; *Bacolophus i. griseus*; *Troglodytes aedon parkmanii*.

The insects in this association were so generally distributed in the associations above and below that no list is reported.

The Pinyons and Junipers cover in the main the mesas and foot

(15) From a study of the skins available of the two subspecies *C. v. grammurus* and *C. v. utah* taken in various parts of southern Utah and with the aid of A. H. Howell's North American Fauna No. 56, 1938, we have not been able to make a satisfactory determination of the ranges of these subspecies in Utah; however, the following represents our present decision in the matter. Specimens from St. George (1), Washington County; La Sal Mts. (2), San Juan County; and Woodside (2), Emery County, are *C. v. grammurus*; while skins from Aspen Grove (1), Vivian Park (1), Grove Creek Mount Timpanogos (1), Provo (2), Utah County; Mount Nebo (1), Juab County; Aurora (1), Sevier County; Beaver (2), Beaver County; Cedar City (1), Iron County; Henrieville (1), Moki Tanks (1), Circle Cliffs, in Garfield County; and Fruita (1), Wayne County, agree with the descriptions given for *C. v. utah*.



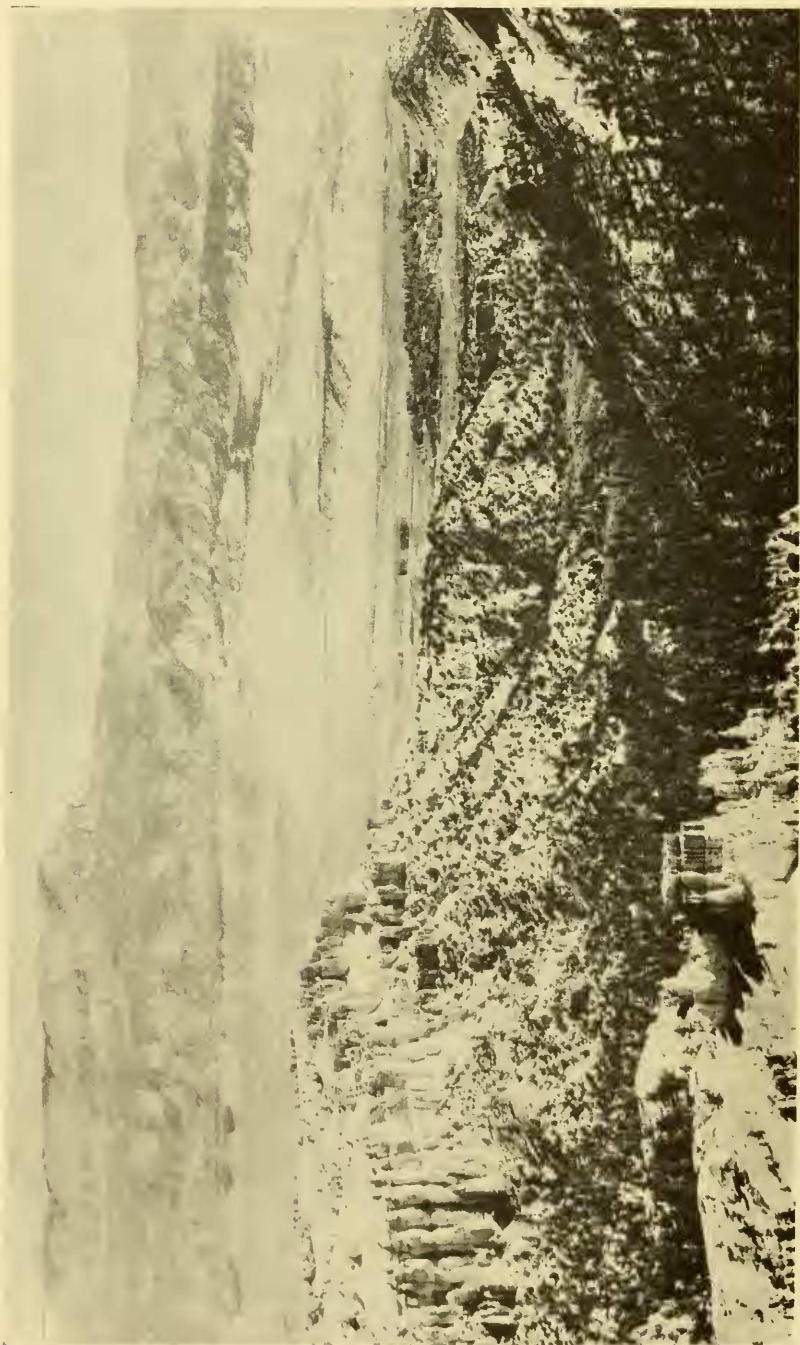


Figure 10. Table Cliff Mountain in the distance looking across Paria River Valley and Bryce Canyon from Inspiration Point. The town of Tropic, Utah, to the right, is in upper Paria Valley. (N. P. S. photo by Grant. From Gregory, Zion-Bryce Museum Bull. No. 4, 1940, through the courtesy of Mr. H. V. Walker, Naturalist, Zion National Park.)



hills; in some places almost pure stands of these dominants are found interspersed with scattered sage brush, *Artemisia tridentata*, and Mountain Mahogany, *Cercocarpus intricatus*. (Fig. 10).

#### YELLOW PINE-OAK-MANZANITA COMMUNITY

Extending in a northeasterly direction from the south end of Table Cliff Mountain (Fig. 10) beyond Birch Creek, Pine Creek, Boulder Creek to Steep Creek at an elevation of 7,000 to 8,500 feet is a belt of Yellow Pine interspersed with Oak brush and Manzanita.

This is a distinctive community, appearing as an ecotone between the Desert Scrub Climax below the Montane Forest Climax above. Here the Manzanita, then the Oak, and Yellow Pine are associated in separating the Pinyon-Juniper from the Aspen-Balsam-Spruce forest. The dominants and influents of this assemblage mix or dove-tail into the contact associations to a very noticeable extent.

The following are some of the common plants:

#### PLANTS

*Pinus brachyptera*; *Juniperus scopulorum*; *Agropyron* sp.; *Fritillaria atropurpurea*; *Salix pseudomyrsinites*; *Betula fontinalis*; *Quercus utahensis*; *Monolepis nuttalliana*; *Arenaria aculeata*; *Thalictrum* sp.; *Cheirinia elata*; *Ribes cereum*; *Potentilla concinna*; *Geum macrophyllum*; *Rosa* sp.; *Prunus melanocarpa*; *Vicia trifida*; *Linum lewisii*; *Artostaphylos platyphylla*; *Convolvulus arvensis*; *Erigeron compositus incertus*; *Antennaria microphylla*; *Actinea arizonicus*; *Achillea lanulosa alpicola*; *Artemisia tridentata*.

#### MAMMALS AND BIRDS

The following mammals and birds were taken in the Oak brush of this association:

*Neosorex p. navigator*; *Thomomys fossor*; *Neotoma cinerea cinerea*; *Cyanocitta s. cottami*; *Nucifraga columbiana*; *Troglodytes axon parkmanii*.

#### THE SPRUCE-BALSAM-ASPEN ASSOCIATION

The face of the Aquarius Plateau, at elevations between 8,500 to 10,000 feet, above the Yellow Pine, Oak brush to the rim of the Plateau is rather distinctly marked off from the Coniferous-Alpine meadow cover of the plateau proper. This belt is noticeable at the Table Cliff pass, Pine Creek, Posy Lake highway and Boulder Highway on the Boulder Mountain. It extends over great areas of the plateau. At Table Cliff Plateau and Mt. Roger both about 10,000 feet are great stands of spruce, balsam and aspens surrounding open meadows.

Dominants and influents follow:

### PLANTS

*Pinus aristata*; *Pinus flexilis*; *Picea pungens*; *Pseudotsuga mucronata*; *Juniperus sibirica*; *Calamagrostis inexpectata*; *Catabrosa aquatica*; *Poa fendleriana*; *Glyceria striata*; *Festuca thurberi*; *Carex festucella*; *Vagnera stellata*; *V. liliacea*; *Corallorhiza maculata*; *Populus aurea*; *Salix bebbiana*; *Urtica breweri*; *Persicaria amphibia*; *Oreobroma pygmaeum*; *Alsine jamesiana*; *Cerastium beringianum*; *Anemone globosa*; *Radicula terrestris*; *Physaria newberri*; *Lesquerella kingii*; *Sophia sonnei*; *Ribes montigenum*; *Potentilla concinnaeformis*; *Dasiphora fruticosa*; *Rosa woodsii*; *Astragalus chamaeleuce*; *Vicia americano*; *Viola montanensis*; *Epilobium stramineum*; *Gayophytum ramosissimum*; *Hippuris vulgaris*; *Cogswellia* sp.; *Gilia aggregata*; *Polemonium viscosum*; *Placelia heterophylla*; *Moldavica parviflora*; *Mentha* sp.; *Pentstemon catoni*; *Pentstemon strictus*; *P. procerus*; *Mimulus guttatus*; *Veronica scryphillifolia*; *Castilleja linariaefolia*; *C. confusa*; *Sambucus caerulea*; *S. microbotrys*; *Symphoricarpos raccinoides*; *Chrysopsis villosa*; *Erigeron flagellaris*; *Hymenopappus cinereus*; *Actinca richardsoni*; *Helenium hoopesii*; *Achillea lanulosa*; *Senecio spartioides*; *Leontodon taraxacum*.

### BIRDS AND MAMMALS

*Ochotoma* sp.; *Thomomys* sp.; *Citellus lateralis lateralis*; *Microtis* sp.; *Myotis v. interior*; *Microtus mordax*; *Eutamias minimus concolorinus*; *Eutamias adsitus*; *Hyclochla guttata auduboni*; *Myadestes townsendii*; *Junco caniceps*; *Colaptes c. collaris*; *Sphyrapicus varius nuchalis*; *Sphyrapicus t. nataliae*.

### ENGELMANN SPRUCE-ALPINE MEADOW ASSOCIATION

This zone is very irregular, mixing down into the Balsam-Aspen belt below. The Aquarius Plateau with an elevation of 10,500 to 11,600 feet, is, in places, covered with extensive forest of *Picea engelmannii*. This may be contrasted with Mount Timpanogos in the Wasatch Mountains which is practically treeless, above 10,500 feet. The exposure and heat absorbing qualities of the surface cover are important factors in these cases. The Aquarius Plateau is rather flat and mesa-like which makes it possible for trees to become established, also the heat and moisture is fairly well distributed and held. The opposite to this is more or less true in the case of Mount Timpanogos which is steep and rugged without areas for plant growth. This

would seem to emphasize the point that the exposure and heat absorbing qualities of an area are more important than actual altitude in determining the biota. Dwarfed aspens extend up to 10,600 feet. The alpine meadows, xerophytic and mesophytic, due to present drainage and wind, as well as glaciation during the Pleistocene, have many herbaceous plants which bloom during the last of June and July.

### PLANTS

Some of the species are as follows:

*Aster glaucodes*; *Antennaria rosulata*; *Artemisia cana*; *Chrysopsis villosa*; *Helenium hoopesii*; *Leontodon taraxacum*; *L. lyratum*; *Senecio spartioides*; *S. suksdorfii*; *Thlaspi glaucum*; *Astragalus chamaecleuce*; *Gilia subnuda*; *Polemonium viscosum*; *Oreobroma pygmaeum*; *Ranunculus scleratus*; *Potentilla concinnaeformis*; *Rosa woodsii*; *Pentstemon procerus*; and *Veronica sperryllifolia*.

### MAMMALS AND BIRDS

Species of mammals and birds that were taken are as follows:

*Ochotoma* spp.; *Thomomys* spp.; *Peromyscus* spp.; *Tamiasciurus* spp.; *Dryobates thyroides nataliae*; *Anas* p. *platyrhynchos*, (Found breeding at Cyclone Lake, several young ducks were collected and observed); *Spizella passerina arizonae*; *Junco caniceps*; *Dendrica a. audubonii*; *Sialia curriecoides*; *Numenius a. americanus*; *Spinus* p. *pinus*; *Poocetes gramineus confinis*; *Hesperiphona vespertina brooksi*; *Actitis macularia*; *Fulica a. americana*; and *Myiochanes r. richardsoni*.

### INSECTS

The greatest amount of collecting was done in the Spruce-Balsam Aspen and the Engelmann-Alpine formations. Insects were found abundant and easy to collect. The following are some of the most characteristic species which were taken:

*Okanagana bella*; *Orphium canora*; *Circatettix verruculatus*; *Cicindela l. montana*; *C. l. laurenti*; *Rhagium lineatum*; *Magdalis lecontei* var. *tenebrosa*; *Peritoxia uniformis*; *Crocidema nigriac*; *Therera frontalis*; *Cryptopogon bimaculatus*; *Stenopogon rufibarbis*; *Cryptopogon plausor*; and *Laphria janus*.

### LISTS OF ANIMAL SPECIES

The following list of Mollusca, Aquatic insects, Amphibians, and Reptiles represent some of the interesting animal species of this area.

It is impossible at this time, because of space, to list other groups. The collectors are reported by their initials: D. E. B., D. Eldon Beck; H. C., Harry Chandler; W. W. T., Wilmer W. Tanner; J. B., James Bee; and V. M. T., Vasco M. Tanner.

#### LAND SNAILS — Mollusca

##### Sphaeriidae

##### PISIDIUM ABDITUM Haldeman

LOCALITIES: Specimens of this species were collected at Posy Lake, Steep Creek Lakes and in a small pond south of the Table Cliff Pass, at elevations from 8,500 to 9,500 feet. Collections were



Figure 11. Posy Lake, Aquarius Plateau, elevation 9,250 feet. A stand of aspens in the background. (By permission of Utah Magazine.)

made in June, 1936 by V. M. T. and D. E. B., and in 1939 by H. C.

HABITAT: The lakes of the Aquarius Plateau are small natural ponds, varying from less than an acre to 8 or 10 acres in surface area and about 1 to 20 feet deep (Fig. 11). The following are some of the plants found in and about these ponds: *Potamogeton richardsonii*; *P. interior*; *Chara* sp.; *Carex aquatilis*; *Lemna trisulca*; *Salix beddiana*; *Urtica brexleri*; *Alsine borealis*; *Aquilegia caerulea albiflora*; *Ranunculus sceleratus*; *Thalictrum megacarpum*; *Arabis drummondii*;

*Geranium caespitosum*; *Viola* sp.; *Plemonium occidentale*; *Sambucus caerulea*; and *Veronica americana*. The fresh water sponge, *Spongilla lacustris* was collected in a number of the lakes. The following Amphibians are common in these ponds, feeding upon the aquatic insects and mollusca: *Ambystoma tigrinum*; *Scaphiopus intermontanus*; and *Pseudacris triseriata*. Fish have been introduced into some of the ponds such as Posy Lake, and will continue to succeed if the ponds are not overstocked, since the food grade of this lake is high.

#### Helicidae

##### VALLONIA CYCLOPHORELLA Ancy

LOCALITY: Several specimens of this species were collected in August, 1939, along the Escalante River by H. C.

##### OREOHELIX STRIGOSA DEPRESSA (Cockerell)

LOCALITIES: This species was found to be common on Table Cliff Mountain, 20 miles west of Escalante, at an elevation of 9,300 feet. Collections were made on June 11, 1936, by V. M. T.

HABITAT: Common under decaying logs of *P. flexilis*, and *P. engelmannii*. This species is also found in the leaf litter in the aspen groves, as well as in rock slides and ledges. It is common in most parts of eastern Utah.

##### MICROPHYSULA INGERSOLLI (Bland)

LOCALITY: Specimens were taken on the Aquarius Plateau above Posy Lake, June 26, 1936, by D. E. B. These were taken under logs while collecting Collembola.

#### Pupillidae

##### VERTIGO COLORADENSIS (Cockerell)

LOCALITY: Harry Chandler collected a number of specimens at Steep Creek in August, 1939.

#### Zonitidae

##### AMNETHUS ALASKANA Dall

LOCALITIES: This species was found to be fairly common at Steep Creek and along the Escalante River on August, 1939, by Harry Chandler.

##### EUCONULUS FULVUS ALASKENSIS (Pilsbry)

LOCALITIES: Harry Chandler collected specimens of this species at Steep Creek and Calf Creek in August, 1939.

##### ZONITOIDES ARBOREA (Say)

LOCALITIES: This species was collected at various places along



the Escalante River to the Colorado River and at Steep Creek, in August, 1939, by H. C.

Succineidae

*SUCCINEA AVARA* Say

LOCALITY: This species has only been collected in the Steep Creek Lakes by V. M. T. in July, 1936 and by H. C. in August, 1939.

Endodontidae

*GONYODISCUS CRONKHITEI* (Newcomb)

LOCALITY: A few specimens collected at Steep Creek in August, 1939, by H. C.

Lymnaeidae

*LYMNAEA PALUSTRIS NUTTALLIANA* (Lea)

LOCALITIES: Specimens of this species collected at Posy Lake, Steep Creek, Boulder Mountain on July 1, 1936, by V. M. T. Specimens were also taken at Steep Creek on June 23, 1938, by D. E. B. and W. W. T. and Cyclone Lakes, June, 1938, by W. W. T.

*LYMNAEA MODICELLA MODICELLA* (Say)

LOCALITIES: This species was found to be fairly common by V. M. T. in the streams running into and from Posy Lake, in June, 1936.

Planorbidae

*HELISOMA TRIVOLVIS TRIVOLVIS* (Say)

LOCALITIES: Collections of this species were made at Posy Lake, and Steep Creek in June and July, 1936, by V. M. T. and D. E. B.; also in June, 1938, by W. W. T.

*GYRAULUS VERMICULARIS VERMICULARIS* (Gould)

LOCALITIES: A common species in the beaver ponds near Boulder and in the lakes at Steep Creek in June and July, 1936. Collections were made by V. M. T. and D. E. B.

Physidae

*PHYSA AMPULLACEA* (Gould)

LOCALITIES: A common species in the streams of Boulder Valley in June, 1936, and 1938. Specimens were collected by V. M. T., D. E. B. and W. W. T.

AQUATIC INSECTS

MAYFLIES — Order Ephemera

*BAETIS* SP.

LOCALITY: Several specimens of this species were collected in

Birch Creek, eight miles west of Escalante on June 15, 1936, by V. M. T. The Mayflies reported here are common in the streams of the Wasatch and High Plateaus of Utah.

*EPHEMERELLA INERMIS* Eaton

LOCALITY: Five specimens were taken in Birch Creek, at the Green Ranger Station on June 15, 1936, by V. M. T.

*RITHROGENA MIMUS* Eaton

LOCALITY: Collected by V. M. T. in Birch Creek below the Green Ranger Station, June 15, 1936.

STONEFLIES — Order Plecoptera

*PTERONARCELLA BADIA* (Hagen)

LOCALITY: Naiads of this species were taken in Birch Creek above the Green Ranger Station, elevation 6,500 feet, June 15, 1936, by V. M. T.

CADDIS FLIES — Order Trichoptera

*LIMNOPHILUS* SP.

LOCALITY: Taken in a small pond above Green Ranger Station on Birch Creek, June 15, 1936, by D. E. Beck. The cases were made of Molluscan shells, *Psidium abditum*.

DRAGON FLIES AND DAMSEL FLIES — Order Odonata

*LIBELLULA QUADRIMACULATA* L.

LOCALITY: This species is fairly common throughout the Escalante River drainage. Specimens were taken around the small lakes at Steep Creek, Boulder Mountains in July, 1936 and June, 1938 by V. M. T. and W. W. T.; also along the seeps of Collett Creek south of Escalante, June 17 and 23, 1936, by V. M. T.

*SYMPETRUM CORRUPTUM* (Hagen)

LOCALITIES: This is the common dragon fly in this region. It was taken along Collett Creek, Garfield County, June 15, 1936, and Willow Tank Springs, Kane County, June 18, 1936; Escalante River near the town of Escalante, June 8, 1936 and Boulder, June 27, 1936 by V. M. T. D. Eldon Beck and Harry Chandler collected this species at Calf Creek, August, 1939.

*LESTES UNCATUS* Kby.

LOCALITY: Several specimens collected along Collett Creek on June 21, 1936, by V. M. T.

*ENALLAGMA CYATHIGERUM* (Charpentier)

LOCALITIES: Specimens taken on the Aquarius Plateaus at Mt. Rogers, Posy Lake, and Steep Creek; also at Boulder and Escalante in June, 1936, by V. M. T.

*ARGIA VIVIDA* Hagen

LOCALITIES: This species was abundant along the Escalante River, near the town of Escalante, on June 8, 1936. A few individuals were taken at Steep Creek on July 1, 1936, by V. M. T.

*AMPHIAGRION ABBREVIATUM* (Selys)

LOCALITIES: This common Utah species was collected at Escalante on Collett Creek in June, 1936, by V. M. T.

*LEUCORRHINIA INTACTA* (Hagen)

LOCALITY: This species has only been taken at a lake on Boulder Mountain, 9,000 feet elevation, in June, 1938, by W. W. T.

*LEUCORRHINIA HUDSONICA* (Selys)

LOCALITIES: This species known only from Tryol Lake in the Uintah Mountains of Utah where it was collected by the writer in July, 1930, at an altitude of 10,000 feet; was also collected at Boulder on June 28, 1936, and Notom, Wayne County, Utah, July 2, 1936, by V. M. T.

## WATER BUGS — Order Hemiptera

*ARCTOCORIXA ABDOMINALIS* (Say)

LOCALITIES: This common species was taken in water puddles at Escalante, Collett Creek, Willow Spring Tank and Boulder, in June, 1936, by V. M. T. It was taken by D. E. B. and H. C. at Calf Creek on the Escalante River in August, 1939.

*NOTONECTA INSULATA* Kby.

LOCALITIES: This common Utah species was collected at Willow Spring Tank, Collett Creek, Escalante, Birch Creek, Posy Lake, Cyclone Lake, Boulder Creek and Steep Creek, in June, 1936 by V. M. T. Specimens also were taken at Calf Creek and on the Escalante River by D. E. B., H. C., and W. W. T. in 1938 and 1939.

*NOTONECTA SPINOSA* Hungerford

LOCALITY: Specimens were taken at Escalante, Utah, June 8, 1936, by V. M. T. This species was named by Dr. Hungerford from specimens taken at Lehi, Utah County, Utah.

*LETHOCERUS AMERICANUS* (Leidy)

LOCALITY: Several adult specimens were taken on the Escalante River near its Junction with the Colorado River, in August, 1939, by D. E. B. and H. C.

*GELASTOCORIS OCULATUS* Fab.

LOCALITIES: This species is common on the sand bars of the Escalante River, Collett and Boulder Creeks.

*RHAGOVELIA EXCELLENTIS* Drake and Harris

LOCALITIES: This species was fairly common on the Escalante River and Boulder Creek. A total of 83 specimens taken in 1936, by the writer and 1939 by D. E. B. and H. C. agree perfectly with the specimens of *R. excellentis* which are before me. Mr. Torre-Burno, in 1921, reported *R. distincta* Champ, from the Yampa River in N. W. Colorado which leads the writer to suspect that this record may prove to be *excellentis*. A large series of specimens of *distincta* have been studied and they are very different to any species found in this portion of the Colorado River.

*GERRIS REMIGIS* (Say)

LOCALITIES: Collected at Boulder and Steep Creek in June, 1936, by V. M. T.

*GERRIS ORBA* Stal.

LOCALITY: Several specimens were taken at Boulder in June, 1936, by V. M. T. It has been reported from Bluff, Utah.

*GERRIS GILLETTEI* Leth. and Sen.

LOCALITIES: A common species at Posy Lake and in Boulder Creek in June, 1936. It was collected by V. M. T.

*GERRIS NOTABILIS* Drake and Harris

LOCALITIES: Taken at Posy Lake, Boulder Creek and Escalante River in June, 1936, and August, 1938 and 1939, by V. M. T., D. E. B. and H. C.

*METROBATES TRUX* (Burno)

LOCALITIES: The specimens are on the whole a little smaller than those from San Marcus, Texas, taken by D. Eldon Beck, June 18, 1934. The Escalante River specimens are not so black but with much more grey, silvery pubescence on the dorsal portion of the thorax. The Utah specimens also lack the distinct flavous pattern found on the head and thorax of the Texas specimens. The male clasping structures are similar in the Utah and Texas specimens I have examined.

We have 93 specimens which were taken in August, 1939, by D. E. B. and H. C. at the mouth of the Escalante River, Kane County, Utah. This is a new record for Utah.

*MICROVELIA* SP.

LOCALITIES: On June 17, 1936 eight specimens were taken at a small seep near Hall Cave (Fig. 6) in Kane County, 55 miles south

of Escalante by V. M. T. In August, 1939 Beck and Chandler collected 24 specimens at Calf Creek on the Escalante River. We are unable to report definitely upon this species at present.

MESOVIELIA SP.

. LOCALITY: Beck and Chandler collected four specimens on the Escalante River near its junction with the Colorado River, in August, 1939. This may be a new species and a new state record for Utah.

BEETLES — Order Coleoptera

OMOPHRON OBLITERATUM VAR. UTENSE Csy.

LOCALITY: Harry Chandler collected a large series of this and the following species at the Mouth of Calf Creek and the Escalante River in August, 1939.

HOMOPHRON AMERICANUM VAR. TEXANUM Csy.

LOCALITY: Taken with *O. oblitteratum* at Calf Creek on the Escalante River by Chandler in August, 1939. A large series of this species was taken at Moab in Grand County by the writer, in June, 1927. This is a new record for the state of Utah.

PELTODYTES CALLOSUS Lec.

LOCALITY: Several specimens collected by Harry Chandler at the Mouth of Calf Creek in August, 1939. This is a new Utah record for this species.

LECCOPHILUS DECIPIENS Lec.

LOCALITY: Several specimens taken at a water seep ten miles south of Escalante, June 16, 1936, by V. M. T. This is the first time this species has been report for Utah.

HYDROPORUS STRIATELLUS (Lec.)

LOCALITIES: Several specimens of this species were collected by D. E. Beck in June, 1940, in Coyote Gulch, five miles east of Willow Spring Tank, Kane County. Specimens of this species were collected in Several Uintah Mountain Lakes, in July and August, 1930, by the writer. This is the first time this species has been reported for Utah.

HYDROPORUS PLANIUSCULUS Fall

LOCALITIES: Five specimens were collected in the Escalante River near its junction with the Colorado River, August, 1939, by D. E. B. and H. C. This species was also taken in the Uintah Mountains in 1930, by the writer. These are new records for Utah.

AGABUS CORDATUS (Lec.)

LOCALITY: A number of specimens were taken at a seep, ten



miles south of Escalante on June 16, 1936, by V. M. T. This is a new record for Utah.

*AGABUS SERIATUS* (Say)

LOCALITY: Three specimens collected five miles east of Willow Spring Tank, Kane County, by D. E. B. and I. M., June, 1940.

*AGABUS LUGENS* (Lec.)

LOCALITIES: A number of specimens are in the collection, some from the Escalante River near its junction with the Colorado, taken in August, 1939, by D. E. B. and H. C., and others from Hanksville, Wayne County, collected by W. D. Stanton and determined by the late H. C. Fall. This is the first time this species has been reported as occurring in Utah.

*AGABUS PERPLEXUS* Sharp

LOCALITY: Beck and Chandler collected this species at Cali Creek, in August, 1939. This is a new record for Utah.

*RHANTUS BINOTATUS* (Harr.)

LOCALITY: This species was common in the lakes of the Aquarius Plateau in June, 1936 and 1938. Specimens collected by V. M. T. and W. W. T.

*DYTISCUS DAURICUS* Gebl.

LOCALITY: Two specimens of this interesting species taken by W. W. T. in a small lake at Steep Creek, Boulder Mountains, in June, 1938. This species has been reported from Colorado by Wickham, but it is a new record for Utah.

*THERMONECTES MARMORATUS* (Hope)

LOCALITIES: Collected at Willow Spring Tank, Kane County, June, 1936, by V. M. T., and five miles east of Willow Spring Tank, June, 1940, by D. E. B. and I. M.

*GYRINUS PICIPES* Aube

LOCALITY: At least two species of this genus were collected on the Aquarius Plateau and the Escalante River in June, 1936, by V. M. T., but we have not been able to get one of them determined satisfactorily..

*BEROSUS* SP.

LOCALITY: A species of *Berosus* not yet determined was collected at Collett Creek in June, 1936, by V. M. T.

*HYDROPHILUS LINEATUS* Lec.

LOCALITY: This large striking species was common at Coyote Gulch in June, 1940; Beck and McArthur collected 15 specimens. A

specimen was collected at Moab, Grand County in June, 1927 by the writer. This is the first time this species has been reported for Utah.

*TROPISTERNUS ELLIPTICUS* (Lec.)

LOCALITY: Specimens of this species were taken at Escalante in June, 1936, by V. M. T. This is an eastern species and is a new record for Utah.

*DONACIA HIRTICOLLIS* Kby.

LOCALITY: Collected at Posy Lake on the Aquarius Plateau in June, 1936, by V. M. T. and June, 1940, by D. E. B.

FLIES — Order Diptera

*SIMULIUM* SP.

LOCALITY: Larvae of a species of Blackfly were abundant on the rocks in Birch Creek on June 15, 1936. Larvae and pupa, but no adults, were collected. The collection was made by V. M. T.

TOADS AND FROGS — Amphibians

*AMEBYSTOMA TIGRINUM* (Green)

LOCALITIES: A common amphibian in all the lakes we studied on the Aquarius Plateau. In some ponds hundreds of individuals were found within a few square yards of water near the shore.

*SCAPHIOPUS INTERMONTANUS* Cope

LOCALITIES: A common species at Willow Spring Tank, Posy Lake, Steep Creek, Calf Creek and Escalante River. Specimens taken by V. M. T., W. W. T., D. E. B., J. B., and H. D., in 1936, 1938, and 1939.

*BUFO BOREAS BOREAS* (Baird and Girard)

LOCALITIES: Loa and Fruita, Wayne County; W. W. T. 1938.

*BUFO PUNCTATUS* (Baird and Girard)

LOCALITIES: Willow Spring Tank, Kane County; Junction of Boulder Creek and Escalante River, Garfield County; V. M. T. 1936, and W. W. T. 1938.

*BUFO WOODHOUSII* (Girard)

LOCALITIES: Fruita and Notom, Wayne County; Boulder, Steep Creek, Tropic, Escalante, and Junction of Boulder Creek and Escalante River, Garfield County.

While collecting at Calf Creek on June 28, 1938 D. E. Beck and W. W. Tanner counted, at evening, the amphibians along the creek. The following three species were collected in one hour: *Scaphiopus intermontanus* 3 adult specimens; *Bufo punctatus* 14 specimens; and

*Bufo woodhousii* 93 specimens. These were observed in a distance of about one-half mile. No frogs were seen.

*PSEUDACRIS TRISERIATA* (Wied.)

LOCALITIES: Boulder Mountain Lakes, from Steep Creek to Posy Lake, Garfield County.

*HYLA ARENICOLOR* Cope

LOCALITY: Three specimens were taken by D. E. B. and H. C. near the Junction of the Colorado and Escalante Rivers.

*RANA PIPIENS* Schreber

LOCALITIES: Orderville, Alton and the Junction of the Colorado and Escalante Rivers, Kane County; Panguitch, Garfield County. Collected by V. M. T., D. E. B. and H. C.

#### LIZARDS AND SNAKES — Reptiles

*CROTOPHYTUS COLLARIS BAILEYI* (Stejneger)

LOCALITIES: Paria, 50 miles south of Cannonville and Henrieville, Kane County. Collected by Byron Davis and V. M. T.

*CROTAPHYTUS WISLIZENII* Baird and Girard

LOCALITIES: Hall Cave and Willow Spring Tank, Kane County. Collected by J. B., D. E. B. and V. M. T., June 1936.

*SAUROMALUS OBESUS* (Baird)

LOCALITY: Collected on Warm Creek, Kane County, by Byron Davis, May 1939.

This is the first record for Utah outside of Washington County.

*UTA LEVIS* Stejneger

LOCALITIES: Fruita and Torrey, Wayne County; Escalante, Moki Tanks and Junction of Calf Creek and Escalante River, Garfield County; collections were made by W. W. T., D. E. B., H. C., J. B., and V. M. T.

*UTA S. STANSBURIANA* Baird and Girard

LOCALITIES: Fruita, Kane County; Escalante, Willow Tank, Cannonville, and Junction of Calf Creek and Escalante River, Garfield County. In 1936 J. B. and V. M. T. made collections. In 1937 and 1938 V. M. T. and W. W. T. collected this species at Cannonville.

*SCELOPORUS UNDULATUS ELONGATUS* (Stejneger)

LOCALITIES: Fruita and Torrey, Wayne County; Cannonville, Escalante and Junction of Calf Creek and Escalante River, Garfield County.

This is a very common species in this area. Specimens were collected by W. W. T. 1938, V. M. T. 1937, D. E. B. and H. C., 1939.

*SCELOPORUS G. GRACIOSUS* (Baird and Girard)

LOCALITIES: Fruita and Torrey, Wayne County; Moki Tanks, Lower Steep Creek, Junction of Calf Creek with Escalante River, and Tropic, Garfield County; Orderville and mouth of Escalante River, Kane County. Collectors, W. W. T. and J. B., 1938, D. E. B. and H. C., 1939.

*SCELOPORUS MAGISTER* (Hallowell)

LOCALITIES: Willow Spring Tank, Hall Cave, and Wahweap Creek, Kane County.

Specimens were collected by V. M. T. and J. B., 1936; and Byron Davis, 1938.

*PHRYNOSOMA DOUGLASSII ORNATISSIMUM* (Girard)

LOCALITIES: Table Cliffs and Aquarius Plateau above Posy Lake, Garfield County; Orderville, Kane County. In 1936 specimens were collected by D. E. B., J. B. and V. M. T.

*CNEMIDOPHORUS SEXLINEATUS PERPLEXUS* (Baird and Girard)

LOCALITIES: Cannonville and Escalante, Garfield County, Orderville, Kane County.

*CNEMIDOPHORUS T. TESSELLATUS* (Say)

LOCALITIES: Notom and Fruita, Wayne County; Junction of Calf Creek and Escalante River, Garfield County; Hall Cave, Wahweap Creek and Mouth of Escalante River, Kane County. Specimens were collected by W. W. T., D. E. B., J. B., H. C., and V. M. T. in 1936, 1938, and 1939.

*COLUBER T. TAENIATUS* (Hallowell)

LOCALITIES: Paria, Kane County; Escalante, Garfield County. Collected by W. W. T., and Walter Astel, Forest Ranger at Escalante.

*PITUOPHIS CATENIFER DESERTICOLA* Stejneger

LOCALITIES: Fruita and Torrey, Wayne County; Tropic and Escalante, Garfield County; Orderville, Wahweap Creek and Willow Spring Tank, Kane County. Specimens were collected by C. L. Hayward, 1937, W. Astel, 1939, W. W. T., 1938.

*LAMPROPELTIS GETULUS BOYLI* Girard

LOCALITY: A large female specimen was taken by D. E. B. June 2, 1940, 30 miles south of Escalante, near the Garfield-Kane County line. The specimen measure 1320 mm in length and is identical with the Boyle King snakes taken in Washington County. This is an interesting new distribution record for this species in Utah.

*THAMNOPHIS ORDINOIDES VAGRANS* (Baird and Girard)

LOCALITIES: Torrey, Notom and Fruita, Wayne County; Steep

Creek, West Deer Lake, Cyclone Lake, and Posy Lake, Boulder, Escalante, Bryce Canyon National Park, Tropic and the Junction of Calf Creek and the Escalante River, Garfield County; and Orderville, Kane County. Specimens have been collected by members of all the parties during the course of this study.

*CROTALUS VIRIDIS LUTOSUS* Klauber

LOCALITIES: Bryce Canyon National Park, Garfield County; Orderville and Kanab, Kane County. Specimens have been collected by V. M. T.

*CROTALUS VIRIDIS DECOLOR* Klauber

LOCALITIES: Tropic, Escalante Desert, and Escalante River 30 miles below Escalante, Garfield County; Hall Cave, Willow Spring Tank, and Wahweap Creek, Kane County. In 1936 several specimens were taken in the Escalante desert by J. B., V. M. T. and D. E. B.

It is interesting to note the close association of the two species of Rattlesnakes in this area. Specimens taken on top of the Plateau, within Bryce Canyon National Park, are *lutosus* while those taken only fifteen miles to the east in the Paria valley are *decolor*.

### SUMMARY

In this preliminary study, biotic information about the Kaiparowits region of south central Utah is presented. The five divisions proposed namely:—the Desert-Prairie Community; the Pinyon-Juniper Association; the Yellow Pine-Oak-Manzanita Community; the Spruce-Balsam-Aspen Association and the Engelmann Spruce-Alpine Association seem to be natural ones, plants and animals being in rather distinct and separate groupings. The majority of the plant and animal species are northern in origin. The southern species are more numerous in the desert and Colorado River portions of this region, suggesting that the Colorado River is serving as a southern portal for the invasion of Sonoran species. As these associations are studied in more detail it will be possible to divide each one into a number of seres. The springs and seep of the desert and the small running streams of the deep, steep walled canyons and gulleys have hydrophytic serae which seem to support distinct species in separate areas of the region. Xerophytic conditions and species are predominant in the Escalante River area.

In this study 225 species of plants; 24 species of mammals; 42 species of birds; 63 species of insects; 15 species of mollusca; 8 species of amphibians and 19 species of reptiles are reported and asso-

ciated with definite localities and communities. Twelve species of aquatic insects are reported for the first time for the state of Utah.

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### The Flying Squirrel Collected in Garfield County, Utah

A flying squirrel, *Glaucomys sabrinus lucifugus* Hall, was collected on November 22, 1939, ten miles southwest of Bryce Canyon National Park, Garfield County, Utah, by Mr. Lowell Hansen, who turned the specimen over to the writer. It was submitted to Dr. E. Raymond Hall, acting director of the Museum of Vertebrate Zoology, Berkeley, California, who kindly compared it with the type specimen. Dr. Hall reports as follows concerning his comparison:

"The specimen agrees with *Glaucomys sabrinus lucifugus* in that (1) the breadth of the rostrum (measured at the anterior margins of the anterior palatine foramina) amounts to less than 53 per cent of the length of the nasals, (2) the face is light colored, and (3) the underparts, including the underside of the tail, are light colored. The upper parts, including the upper side of the tail, are darker than in the type specimen but lack the red of *bangsi*. The upper parts match those of a specimen at hand from Camp Tendoy, near Pocatello, Idaho, labeled *bangsi* but which general comparisons indicate is tending toward *lucifugus*. Except in this one feature, darker color of upper parts, the specimen agrees with *G. s. lucifugus*, and this darker color of the upper parts is of slight amount; it may be only individual variation."

According to Dr. Hall's records, this is the farthest south in the western states this species has been taken, outside of California. This species was first definitely reported as occurring in Utah by the writer in 1927 in the Journal of Mammalogy, Vol. 8, p. 251, as *Glaucomys sabrinus bangsi*. In 1934, in the Occasional Paper, No. 296 of the Museum of Zoology, of the University of Michigan, Dr. E. R. Hall gave the Utah specimens the subspecific name of *lucifugus*. All the specimens collected in Utah previous to this one have been taken in the Uintah and Wasatch Mountains. This new record is 200 miles south in the high Plateaus of Utah. The skin and skull upon which this record is based are now in the mammal collection of the Brigham Young University.—V. M. T.